Full-Scale Aircraft Structural Test Evaluation and Research (FASTER) Facility, Building 211

Completed in 1998, the Full-Scale Aircraft Structural Test Evaluation and Research (FASTER) facility is capable of testing full-scale fuselage panels under conditions representative of those experienced by an aircraft in actual operation.

The data obtained from tests are used to support and validate methodologies developed by the Federal Aviation Administration (FAA) to assess airframe structural integrity and widespread fatigue damage.

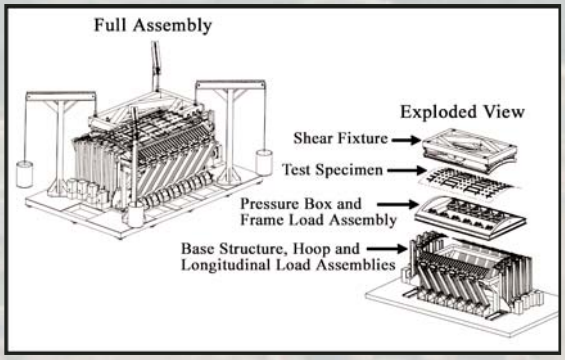
The FASTER fixture was developed under a contract with The Boeing Company, Long Beach, CA, and features a unique adaptation of mechanical, fluid, and electronic components capable of applying pressurization, longitudinal, hoop, and shear loads to a fuselage panel.

The internal pressure is applied using water as media, eliminating the possibility of a catastrophic accident. The system is capable of dynamically cycling the internal pressure as well as performing a static pressurization to levels above flight gradients.

The hoop and longitudinal stresses are simulated by the controlled application of distributed loads around the perimeter of the test panel. Hoop forces are distributed by individual loading linkages using a two-tier coaxial whiffle tree assembly, which generates four equal forces from each controlled load point. A total of 7 load points are used on each side of the specimen, creating a total of 28 attachment points. Longitudinal forces are created using similar loading devices on each end of the panel, consisting of 4 load control points and

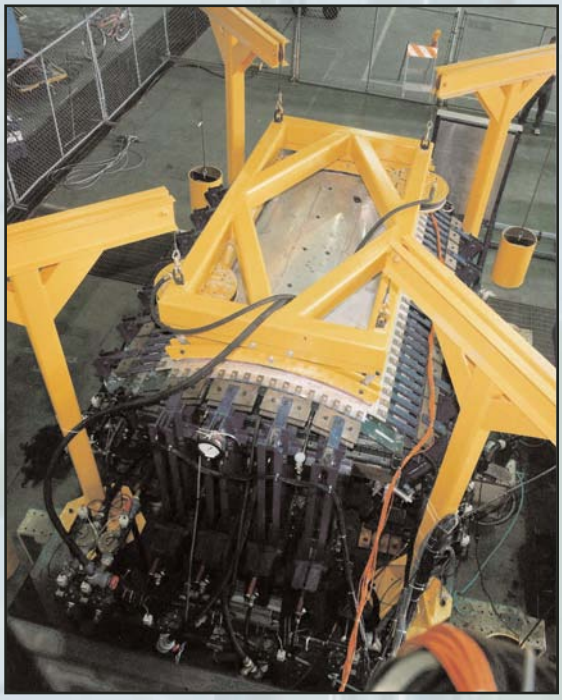
16 attachment points. Similar devices are available to apply bending and tension loads at each end of a frame.

An innovative shear-loading system was developed that uses two load distribution points in the longitudinal direction at the edges of the specimen. The force is applied as a couple and is reacted by a couple in the hoop direction. A unique feature of the shear-loading system is the elastomeric coupling between the loading mechanisms and the test specimen. The elastomer, which has a soft shear modulus, creates a close approximation to uniform shear distribution in both the applied and reacted couples.



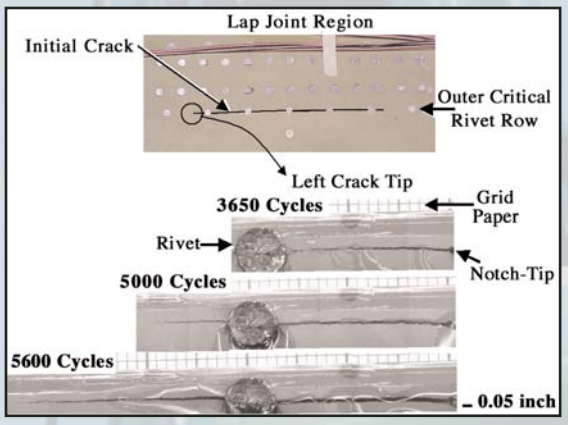
All forces are generated using water as the fluid medium. The external loads are generated by applying water pressure to bladder-type actuators, which are controlled by pressure-activated dome valves. The

dome valves are automatically controlled by using electro-pneumatic control valves. The valves are driven by a computer control system in a closed-loop configuration.



A graphical interface allows the operator to control the loads, speed, and type of test desired. Data acquisition from strain transducers, load transducers, pressure transducers, etc., are displayed on color monitors in real time, as well as stored for offline analysis.

A key component of the FASTER facility is the Remote Controlled Crack Monitoring (RCCM) system developed to track and record the formation and growth of multiple cracks in real time during a test. The RCCM system is a stand-alone, computer-based video data acquisition system capable of monitoring the entire fuselage panel test surface at several levels of magnification with a field of view ranging from 0.05″ up to 14″. Digital images taken from the RCCM system are used to measure crack growth in the test panels, such as a crack located in a longitudinal lap joint of a fuselage panel. Crack growth data verifies the predictive models developed by the FAA to assess cracking in aircraft structures.



To find out more about the FASTER Facility, contact:

Airport and Aircraft Safety Research and Development Division
Airworthiness Assurance Branch, AAR-480

Federal Aviation Administration
William J. Hughes Technical Center
Atlantic City International Airport, NJ 08405
Phone: (609) 485-4784
Fax: (609) 485-4004
http://aar400.tc.faa.gov